Accurate experimental log(gf) for the calculation of chemical abundances

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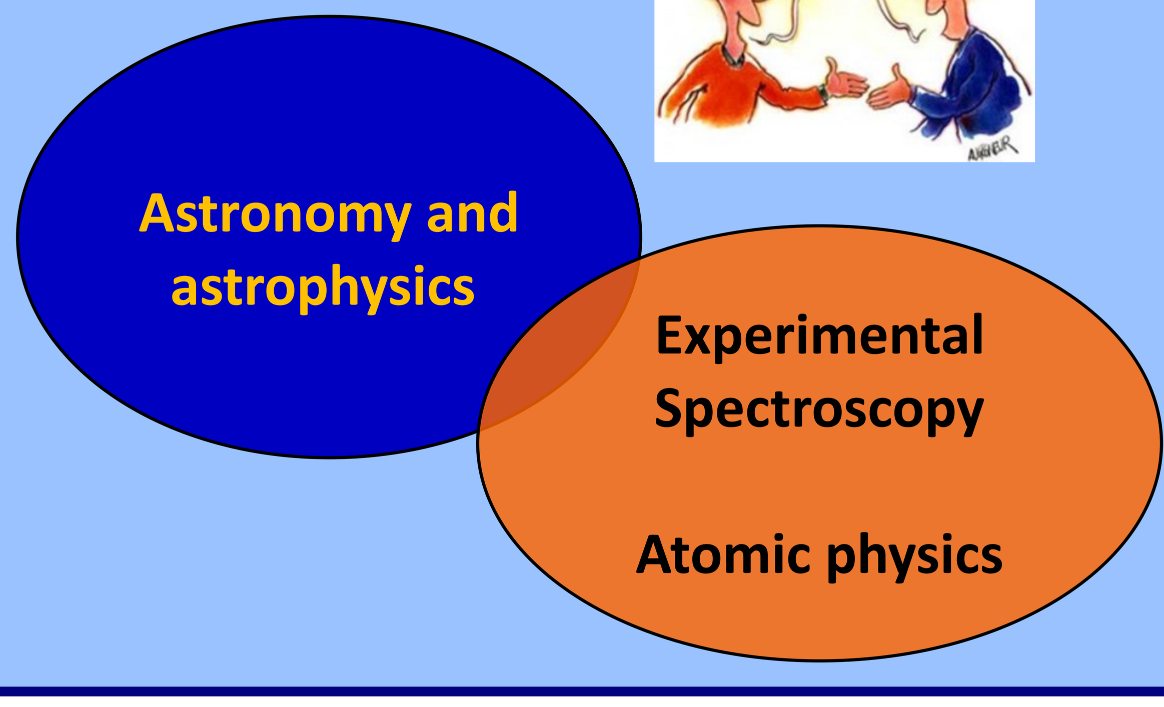
The accuracy of CHEMICAL ABUNDANCES is directly linked not only to the quality of stellar spectra, from which the equivalent widths (EW) of lines are measured, but also to the log(gf) (transition probability) of the transition [1]:

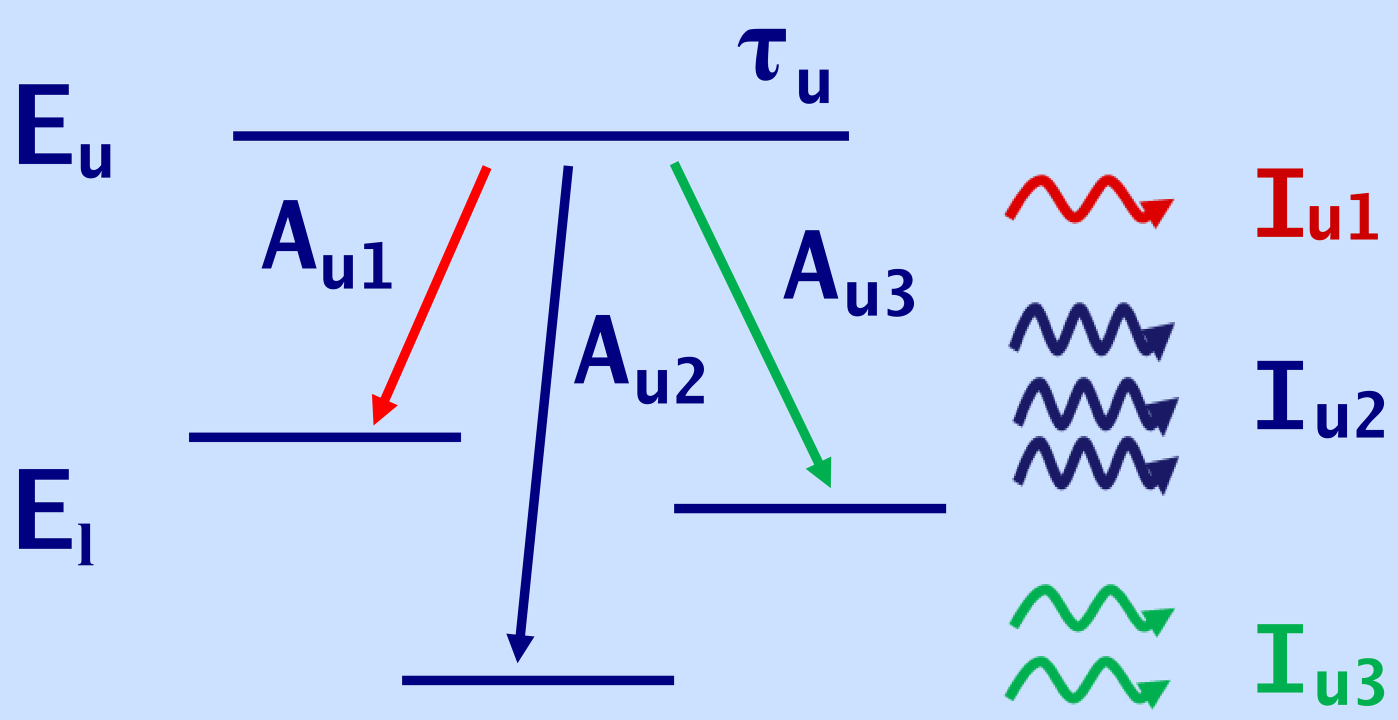
$$\boxed{\log\left(\frac{EW}{\lambda}\right) = \log(Abundance) + \log(\lambda g f) + C + \text{other parameters}}$$

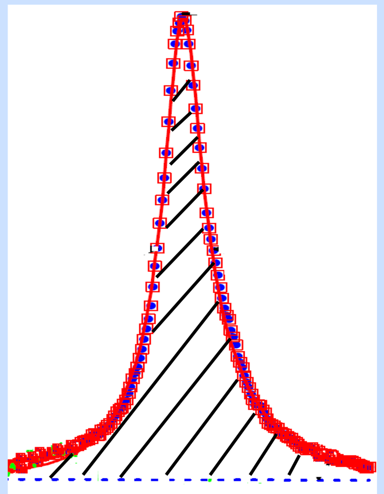
Although large investments of time and money have been done to record spectra of astro-physical objects at unprecedented resolution, the quantity and quality of the existing atomic data lies far from the current needs, remaining the Achilles' heel of Galactic Archaeology.



MEASURING TRANSITION PROBABILITIES

We obtain **transition probabilities** (A_{ul}) by combining **branching fractions** (BF_{ul}) measured from high resolution emission spectra with **upper level lifetimes** (τ_u) obtained from laser induced fluorescence.





The intensity of the line is the area under the fitted profile

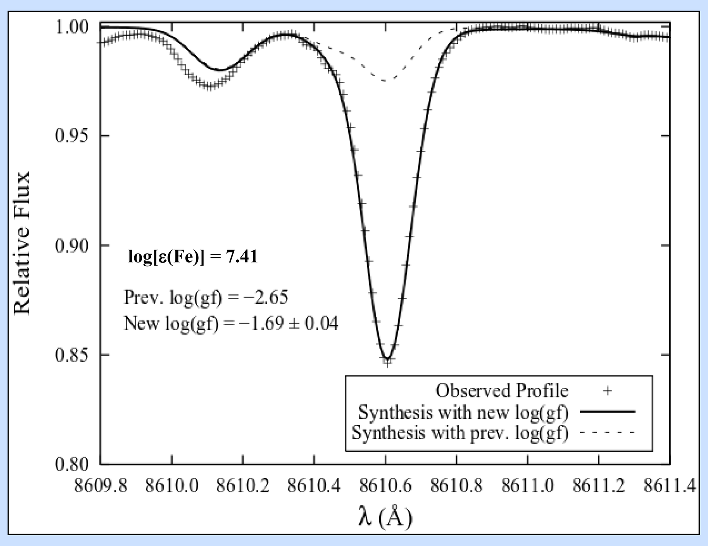
$$\tau_u = \frac{1}{\sum_l A_{ul}}$$

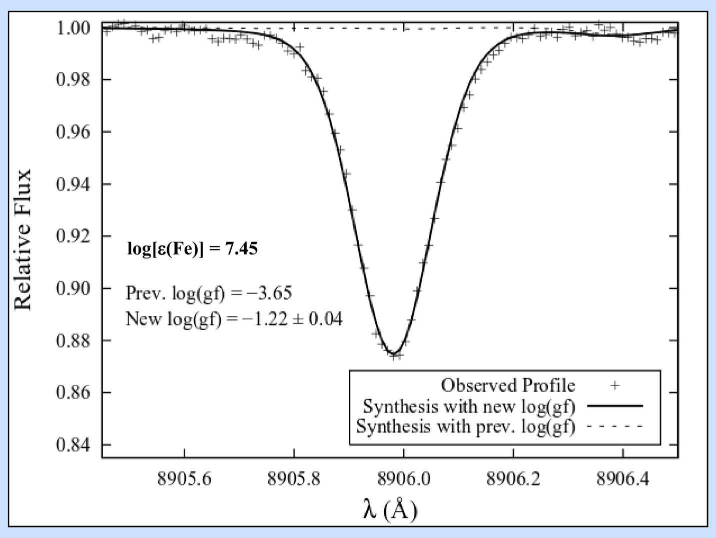
$$BF_{ul} = \frac{I_{ul}}{\sum_l I_{ul}} = \frac{A_{ul}}{\sum_l A_{ul}}$$

$$\boxed{A_{ul} = \frac{BF_{ul}}{\tau_u}}$$

OUR LATEST log(gf) DATA

The **IRON spectrum** is of vital importance to obtain **stellar metallicity.** Over the last years, our group has measured **accurate transition probabilities (log(gf))** for hundreds of transitions of **Fe I** [2–5]. Around 50 of them were urgently needed by GES.





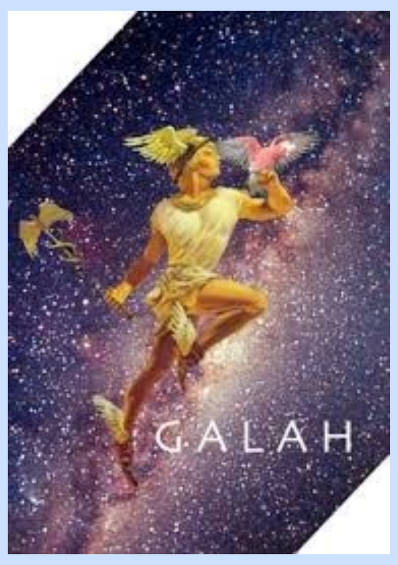
The plots illustrate two sample line profiles used to measure the Solar Fe abundance (log[ε(Fe)]). The **values in bold** were obtained by fitting with our new log(gf)-values.

The dotted line shows the profiles that would have been obtained for these abundances with the best previously published log(gf)-values.

GaiaESO APOGEE

FUTURE GALACTIC SURVEYS

We would like to launch an appeal to **COLLABORATE** with all those astronomers and research groups who need **ACCURATE ATOMIC DATA.**



WEAVE 4MOST

We can provide new accurate log(gf) data

For **neutral (I)**, **singly- (II)**, and **doubly-ionised (III)** elements.

Spectral range: 140 nm – 5 μm
Resolving power: 2 000 000 (at 200 nm)

Bibliography

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More information is available online: www.sp.ph.ic.ac.uk/~julietp/FTS/

Please contact us to discuss your requirements!
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